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Automatic Fiscal Stabilisers:

What they are and what they do.

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Abstract

The global financial and economic crisis has revived the debate in the academic literature and in policy circles about the size and effectiveness of automatic fiscal stabilisers. Especially in the euro area where monetary policy is centralised and discretionary fiscal policy making is constrained by the EU fiscal rules, knowing the size and the effectiveness of automatic stabilisers is crucial. While automatic stabilisers are a fairly established concept in the fiscal policy literature, there is still no consensus about their actual nature and their effectiveness. This paper shows that differences in opinion mirror a deeper disagreement over how the budget would look like without automatic stabilisers. This issue is addressed by defining two types of counterfactual budgets giving rise to two different interpretations about the nature of automatic stabilisation. Simulations with a structural model confirm that the degree of smoothing is conditional on how the counterfactual budget, i.e. the budget without automatic stabilisers, is defined.

Keywords: Automatic stabilisers, budget balance, output smoothing, model simulation
JEL classification: H6, H30, E37, E62

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1. Introduction and motivation

The post-2007 economic and financial crisis has reopened the debate on the effectiveness of fiscal policy as a tool of stabilisation of economic activity, including the relative merits of discretionary action versus automatic stabilisation. On one side of the debate, people have argued that discretionary fiscal policy is not an effective stabilisation tool. Especially from a political economy point of view, long decision and implementation lags associated with discretionary fiscal policy are often mentioned as arguments why such policies might be ineffective. According to this view, one should instead rely on the workings of automatic stabilisers to do their job in stabilising the economy as any attempt to stabilise via discretionary measures is destined to be counter-productive. A comprehensive overview of these types of arguments is provided in e.g. Hemming et al. (2002), Taylor (2009), and Cogan et al. (2010). Others have argued the severity of the crisis required automatic stabilisers to be complemented by discretionary action and that the persistence of the crisis meant implementation lags were arguably of lesser importance than under normal circumstances. This camp emphasised the presence of financially constrained households and accommodative monetary policy when interest rates are constrained by the zero lower bound, two factors that render discretionary fiscal policy effective again and raise the size of the fiscal multiplier (see e.g. Christiano, Eichenbaum and Rebelo, 2011, Davig and Leeper (2011) and Coenen et al., 2012). Both sides of this debate would agree that the main advantage of automatic fiscal stabilisers is that they do no not require deliberate intervention by government and hence are not subject to implementation lags. But the crucial questions is how much output stabilisation they deliver.

In spite of a relatively large and seasoned body of literature on automatic stabilisers, both the policy and the academic debate reveal a persisting lack of clarity about what automatic fiscal stabilisers actually are and how to assess their effectiveness with respect to output smoothing. Except for the notional understanding that automatic stabilisers involve budgetary arrangements that help smooth output without the explicit intervention of a country's fiscal authority, views still very much diverge about which elements or components of the budget actually provide the bulk of automatic stabilisation over the cycle. There are no doubts concerning unemployment benefits: they unambiguously increase during downturns and decrease in upswings. However, from a practical point of view, unemployment benefits are rather negligible as they account for a very small share of governments' budget in most

advanced countries. The bulk of automatic stabilisation originates somewhere else; but where?

The aim of this paper is to clarify the nature, size and effect of these automatic stabilisers. Special attention is given to the relevance of defining the correct benchmark against which the effectiveness of automatic stabilisers is measured. By making the counterfactual explicit, it also becomes evident that diverging views and estimates in the literature are the reflection of different, and most of time implicit, assumptions about a 'cyclically-neutral' budget. [1]

The analysis of fiscal stabilisation is especially relevant in the EU, in view of the specifics of the EU macroeconomic policy framework. In the Economic and Monetary Union (EMU) monetary policy making is centralised and delegated to the European Central Bank (ECB). Hence, individual member states are left with fiscal policy to stabilize their economies in the event of idiosyncratic shocks. At the same time, fiscal policy is to be carried out within the boundaries of the Stability and Growth Pact (SGP) which, in a nutshell, requires member states to avoid excessive deficits and to achieve a medium term objective which ensures the long-term stability of public finances. The new fiscal compact goes even further and sets a legally binding maximum structural deficit of 0.5% of GDP while the maximum actual deficit cannot exceed 3% of GDP. This leaves no room for discretionary fiscal policy and highlights the importance of knowing whether automatic stabilisers alone can deliver sufficient stabilisation.

The remainder of the paper is organised as follows. Section 2 takes a look at the existing literature and highlights the different interpretations of the concept of automatic stabilisers. Section 3 examines the background to the different interpretations by clarifying the role of the benchmark budget against which the effect of automatic stabilisers is to be assessed. Section 4 provides an overview of empirical estimates of the effect of automatic stabilisers in the literature. This is followed by simulations mimicking the shocks experienced during the post-2007 recession with a calibrated structural model for the euro area. The effectiveness of automatic stabilisation in terms of smoothing output is then assessed by a comparison with alternative scenarios in which expenditure and revenue are kept constant in levels or as share of GDP. The simulation results underscore the fact that the degree of output smoothing of

[1] Our analysis is purely positive and we are not concerned with normative implications of automatic stabilisers. Some of the macroeconomic literature would suggest that sizeable macroeconomic fluctuations may be desirable adjustment to shocks from a welfare perspective and a normative analysis should consider the potential of automatic stabilisers to remove or mitigate welfare losses associated with nominal and real rigidities in the economy.

automatic stabilisers crucially depends on the counterfactual budget, that is, the budget without automatic stabilisers.

2. Automatic stabilisers: An old friend with a fuzzy profile?

Automatic stabilisers are an integral part of the fiscal policy arsenal of a country. On the revenue side, taxes are a very obvious and much discussed source of automatic stabilisation (see for instance Auerbach and Feenberg, 2000). Over the cycle, tax revenues tend to follow their respective tax base: they increase during upturns and shrink during downturns. On the expenditure side, the most prominent automatic stabiliser discussed in the literature are unemployment benefits. Their total amount increases during downturns and decreases during upswings. Melitz and Darby (2008) argue that age- and health related social expenditure also reacts to the cycle in a stabilizing manner. Hajdenberg et al. (2010), by contrast, conclude that in developed countries social spending is a-cyclical.

However, automatic stabilisation is not necessarily limited to cyclically sensitive items in the budget. In the literature, the size of the government is also associated with automatic stabilisation. Research has shown that the size of government is negatively correlated with the volatility of GDP (e.g. Fatás and Mihov, 2001; Lee and Sung, 2007). This can be explained by the fact that the bulk of government discretionary expenditure, such as wages and transfers, is generally not cut during economic downturns or increased during upturns. This inertia of government expenditure has a stabilising effect on total output. Rodrik (1998) for instance argues that open economies tend to have bigger governments so as to protect themselves from their larger exposure to external shocks.

Overall, while we all have an intuitive understanding of what they are, there is no agreed view in the literature on the relative importance of the different elements of automatic stabilisers. Some claim that stabilisation mainly results from the cyclical sensitivity of revenues; others associate the bulk of automatic stabilisers with the size and inertia of discretionary spending, while still others believe that progressive taxation and unemployment benefits are the sole source of automatic stabilisation.

When analysing automatic stabilisers, one can look at both their size and their degree of output smoothing. The size of the automatic stabilisers is generally defined as the change in

the budget resulting from a change in economic activity. In general, there are two types of indicators to measure this change: the budgetary sensitivity and the semi-elasticity.

The budgetary sensitivity, which for instance is used by the European Commission in the context of the EU fiscal surveillance framework, measures the change in the level of revenues and expenditure resulting from a marginal change in GDP:

$$\varepsilon_R = \theta_R \frac{R}{Y} = \left[\left(\frac{dR}{dY}\frac{Y}{R}\right)\frac{R}{Y}\right] = \frac{dR}{dY}$$

$$\varepsilon_G = \theta_G \frac{G}{Y} = \left[\left(\frac{dG}{dY}\frac{Y}{G}\right)\frac{G}{Y}\right] = \frac{dG}{dY}$$

Where R denotes government revenues, G government expenditure, and θ_R and θ_R the GDP elasticity of government revenues and expenditure respectively.

The budgetary semi-elasticity, which is used by the IMF and the OECD, measures the reaction of the ratios of expenditure and revenues to GDP to a relative change in GDP.

$$\eta_R = \frac{d\left(\frac{R}{Y}\right)}{\frac{dY}{Y}} = (\theta_R - 1)\frac{R}{Y}$$

$$\eta_G = \frac{d\left(\frac{G}{Y}\right)}{\frac{dY}{Y}} = (\theta_G - 1)\frac{G}{Y}$$

Table 1 shows empirical estimates of the budgetary sensitivities and semi-elasticities of the Euro area and the participating EU member states.

The cross-country differences in the estimates reflect an number of factors, notably the degree of progressivity of the tax system, the importance of unemployment benefits, and the size of government as measured by the government revenue and expenditure ratio *R/Y* and *G/Y*. In the case of Germany, for instance, the relatively large estimates are due to the comparatively large size of government. In the case of the Netherlands it is a combination of both the size of government and the relative importance of unemployment benefits. Ireland represent the other extreme, where a small government and a lean unemployment benefit system explain the small size of automatic stabilisers.

Table 1: Budgetary sensitivities and semi-elasticities

	Sensitivity			Semi-elasticity		
	Revenues	**Expenditure**	**Total**	**Revenues**	**Expenditure**	**Total**
Austria	0.43	-0.04	0.47	-0.02	-0.47	0.45
Belgium	0.47	-0.07	0.54	-0.00	-0.50	0.49
Cyprus	0.39	-0.01	0.39	0.05	-0.37	0.42
Estonia	0.29	-0.01	0.30	-0.04	-0.31	0.27
Finland	0.41	-0.09	0.50	-0.03	-0.53	0.49
France	0.44	-0.06	0.49	-0.01	-0.51	0.50
Germany	0.40	-0.11	0.51	-0.01	-0.53	0.51
Greece	0.42	-0.01	0.43	0.03	-0.37	0.40
Ireland	0.36	-0.05	0.40	0.04	-0.32	0.37
Italy	0.49	-0.02	0.50	0.07	-0.41	0.48
Luxemburg	0.48	-0.01	0.49	0.06	-0.40	0.47
Malta	0.35	-0.01	0.36	0.01	-0.40	0.40
Netherlands	0.39	-0.17	0.55	0.04	-0.55	0.56
Portugal	0.41	-0.04	0.45	0.03	-0.43	0.46
Slovakia	0.27	-0.02	0.29	-0.04	-0.46	0.43
Slovenia	0.41	-0.05	0.47	0.01	-0.46	0.47
Spain	0.38	-0.05	0.43	0.03	-0.36	0.39
Euro area average	0.41	-0.05	0.45	0.01	-0.44	0.46

Source: European Commission (2006); Deroose et al. (2011); Girouard and Andre (2005)
Notes: The elasticities used for these estimates are listed in the annex. Euro area average is unweighted.

Apart from the cross-country variation, Table 1 also illustrates a key conceptual difference between the budgetary sensitivity on the one hand and the semi-elasticity on the other. While the estimates of both measures are roughly the same for the budget as a whole, they differ significantly as regards the relative contribution of government expenditure and revenues. The budgetary sensitivity indicator allocates the predominent contribution to automatic stablisation to the revenue side of the budget, with expenditure playing a marginal part. The semi-elasticities, by contrast, present the mirror view: the bulk of automatic stabilisation is associated with the expenditure ratio, with almost no contribution from the revenue side of the budget.

This difference is of course implied by the way the two indicators are defined: one looks at changes in levels, the other at changes in ratios to GDP. At the same time, the definitions also embody different views about a budget in which automatic stabilisers are not allowed to work, that is, a view about a counterfactual budget without automatic stabilisers. By focusing on changes in levels, budgetary sensitivities implicitly assume that without build-in automatic

stabilisers budgetary components would remain constant in levels. By focusing on ratios to GDP, semi-elasticities presume a neutral budget whereby expenditure and revenues remain proportional with respect the variable that is expected to be stabilised notably GDP. As such, different benchmark budgets will also imply different sources of automatic stabilisation.

3. What is the counterfactual to automatic stabilisers?

When evaluating the effectiveness of automatic stabilisers, as measured by the degree of output smoothing produced by the built-in budgetary elements, one has to compare the outcome with a situation where the automatic stabilisers are "switched off".

The fact that many different views on the nature of automatic stabilisers prevail in the literature shows that, until now, no general benchmark has been established. In general, we can distinguish between two types of benchmark budgets, matching the two indicators of the size of automatic stabilisers discussed in the previous section: the first entails keeping the levels of government expenditure and revenues fixed, while in the second government expenditure and revenues vary with GDP so as to keep their ratio constant.

Table 2 gives an overview of a selection of key papers on automatic stabilisers. For each paper the estimated degree of output smoothing is reported, together with the assumed benchmark budget.

As can be seen in Table 2, both types of benchmark budgets are used in the literature. The exact configuration of the neutral budget, however, varies significantly. Most papers in the relevant literature do not explicitly define the benchmark or counterfactual budget. In most cases, however, upon careful reading, the benchmark can be inferred.

Table 2: Degree of output smoothing - Overview of literature

Paper	Sample	Output smoothing	Benchmark budget
Auerbach and Feenberg (2000)	US	8%	Lump sum revenues
Cohen and Follette (2000)	US	10%	Fixed level of revenues
Van den Noord (2000)	19 OECD countries	25%	Fixed ratios of revenues and expenditure
Buti et al. (2002)	Belgium	14%	Fixed ratio of fiscal balance
	France	22%	
Meyermans (2002)	Euro Area	11%	Fixed deficit-to-GDP ratio
	US	20%	
Barrell et al. (2002)	Euro area	9%	Fixed levels of revenues and expenditure
Brunilla et al. (2003)	EU	Consumption shock: 20-30%	fixed level of fiscal balance
		Private investment shock: 3-10%	
Barrell and Pina (2004)	Euro area	11%	Fixed levels of revenues and expenditure
Tödter et Scharnagl (2004)	Germany	Consumption shock: 18-26%	Fixed level of fiscal balance
		Investment shock: 10-15%	
Follette and Lutz (2010)	US	10% after 4 quarters, 20% after 8 quarters	fixed levels of revenues and expenditure
Dolls et al. (2012)	US	Income shock: 6-17%, Unemployment shock: 7-20%	Lump sum revenues and expenditure
	Europe	Income shock: 4-22%, Unemployment shock: 13-30%	

The very early literature on automatic stabilisation, best represented by Musgrave and Miller (1948), mostly uses a benchmark where both revenue and expenditure are fixed in absolute values. A similar assumption is used by Auerbach and Feenberg (2000) who define the stabilising effect of taxes as compared to a situation in which taxes are of a lump sum type, and hence do not affect disposable income in case of cyclical fluctuations. Many other researchers have followed variations of this approach. For instance, Barrel et al. (2002) who fix taxes and spending at the level implied by their 'structural rate'. The same method is used by Barrel and Pina (2004). Cohen and Follette (2000) set each tax rate to zero in the benchmark and introduce an add factor that sets tax receipts equal to their baseline values.

Brunila et al. (2003) define the benchmark budget as one where the impact of economic fluctuations is offset by across-the-board changes in other budget items, so as to keep the overall fiscal balance constant. Tödter and Scharnagl (2004) use three different methods to keep the level of budget balance fixed in the benchmark: exogenisation of the budget components, revenue compensation and expenditure compensation. Contrary to the exogenisation approach, the compensation approach lets automatic stabilisers active, but compensates their effect by discretionary changes in revenues or expenditure. Follette and Lutz (2010) define the benchmark as the case where taxes are independent of income and transfers are independent of the unemployment rate, which implies that the level of taxes and transfers is kept constant. Following the basic approach of Auerbach and Feenberg (2000), Dolls et al. (2012) implicitly assume that in the benchmark budget revenues and transfers are of a lump sum type.

Van den Noord (2000), by contrast sets taxes and spending equal to their structural rate, as a constant share of GDP. Buti et al. (2002) require for their benchmark that the primary fiscal balance as a percentage of GDP always stays at its baseline level. Meyermans (2002) keeps the deficit-to-GDP ratio constant in every period, by adjusting the direct labour income tax rate.

Views about the nature of a neutral budget are also to be found in studies not directly linked to the idea of automatic stabilisers. While there is a common understanding that, under unchanged policies, government revenues broadly follows output, the situation is less clear as regards a neutral expenditure path. In an attempt to seperate discretionary and automatic elements in the budget, Buti and Van den Noord (2003) define neutral expenditure as expenditure that moves in proportion with potential output plus expected inflation. Fatás et al. (2003) consider three different definitions of a neutral spending path: government spending is held constant in volume terms; government expenditure grows in line with revenues; government expenditure grows in proportion with trend GDP. The ambiguity concerning neutral government expenditure as opposed to the clear view on revenues mirrors the very nature of the main budgetary items. While tax codes unambiguously link tax revenues to different forms of income, which in turn are more or less synchronised with total GDP, no such clear relation can be established for discretionary expenditure.

On the face of it, a discussion about different views concerning the appropriate benchmark budget might seem rather futile if not completely irrelevant, since by their very nature,

automatic stabilisers do their job of output stabilisation irrespective of whether economists understand their mechanics or not. However, when the actual effectiveness of the stabilisers is to be evaluated, the benchmark has to be made explicit. The lack of a commonly agreed view on what a neutral budget looks like, can partly be explained by the fact that, apart from unemployment benefits, automatic stabilisation is largely the welcome but unintentional effect of budgetary arrangements that were designed to serve other purposes: progressive taxation is primarily motivated by distributional considerations; different sizes of government reflect different views about the reflective merits of private versus public provisions of goods and services; and unemployment benefits can be motivated by both social and efficiency considerations.

As hinted at above, the choice of the benchmark determines the narrative about the origin of automatic stabilisation. Those who define a neutral budget as a budget where expenditure and revenues are fixed in levels, see changes in the level of taxation and unemployment benefits as automatically stabilising. Since unemployment benefits are relatively small, the bulk of stabilisation is associated with the revenue side of the budget. If the benchmark budget is defined as one where revenue and expenditure are constant as share of GDP, automatic stabilisations mainly stems from progressive taxation and the size of government, notably from the fact that the bulk of government expenditure does not respond to cyclical fluctuations. The difference is particularly clear in the case of proportional taxation: proportional taxes can only be taken to produce a stabilising effect on output if in the benchmark budget revenues are fixed in levels. A similar reasoning applies to discretionary spending. The inertia of government spending, in particular wages and transfers, can only produce a stabilising effect of total output if in the neutral budget government expenditure is taken to follow GDP.

4. Degree of output smoothing of automatic stabilisers

4.1 Empirical estimates in literature

The most common method to estimate the effect of automatic stabilisers is the use of simulation models. As was already highlighted in Table 2, previous estimates in the literature vary significantly. Cohen and Follette (2000) conclude that in the US built-in stabilisers smooth output fluctuations by about 10 per cent,while Follette and Lutz (2010) find a

stabilisation of approximately 10 per cent after four quarters and 20 per cent after eight quarters. Also for the US, Auerbach and Feenberg (2000) estimate that automatic stabilsers offset about 8 per cent of cyclical output fluctuations. Simulations by OECD (Van den Noord, 2000) indicate a degree of smoothing of on average a quarter during the 1990s in 19 OECD member countries. Meyermans (2002) finds that GDP stabilisation after a demand shock equals about 11 per cent in the euro area and 20 per cent in the US. For the Euro area Barrel et al. (2002) estimate stabilisation gains at 9 per cent when considering only taxes and unemployment benefits. Barrell and Pina (2004) estimate these gains at 11 per cent. By contrast, Dolls et al. (2012) find that automatic stabilizers give rise to a demand stabilization for income shocks of 4 to 22 per cent in the EU, depending on the share of liquidity constraints, and 6 to 17 per cent in the US, with large differences between the EU countries.

Brunilla et al. (2003) emphasise the fact that the effectiveness of automatic stabilisers depends on the type of shock to the economy. They estimate that in the Eurozone about 20 to 30 per cent of a private consumption shock is smoothed by taxes and unemployment benefits, whereas this is only 3 to 10 per cent for a private investment shock. The importance of the type of shock is confirmed by Tödter and Scharnagl (2004), who find that in Germany, the Netherlands, France, UK, Italy, Japan and the US, a consumption shock is better smoothed than other demand shocks. Smoothing power is more or less the same in these countries, except for Japan where automatic stabilisers are found to be significantly more effective.

The substantial differences in these estimates can be explained by the use of different simulation methods, but also by different definitions of automatic stabilisers and, linked to that, of benchmark budgets. Outcomes that are based on different understandings of the concept of automatic stabilisers cannot be compared properly.

At this stage it may be useful to recall that automatic stabilisers only work with temporary demand and supply shocks. They may lead to unsustainable levels of government spending and taxation in the case of a permanent supply shocks. A permanent supply shock requires adjustment to the new equilibrium rather than output stabilisation. In fact, automatic stabilisation will in this case only slow down the adjustment process (Buti and Franco, 2005).[2]

[2] Given the uncertainty about the temporary or permanent nature of shocks, strong automatic stabilisers may therefore not always be desirable. In the same spirit, there could be potential conflicts between automatic stabilisation and structural reforms.

4.2 Simulations with the QUEST model

In order to show the importance of defining a proper benchmark budget, we run model simulations with the European Commission's QUEST model, of which details are provided in the Annex.

We first simulate different types of economic shocks for two alternative benchmark budgets. The results of these benchmark simulations are then compared to a configuration where the same shocks are sent through the model in which automatic stabilisers are switched on.

With a view to assessing the role of automatic stabilisation in the recent past, our simulations are designed to mimic the main facts of the post-2007 recession. Table 3 shows the growth rates for the main macroeconomic aggregates of the euro area during the financial crisis. Real GDP fell in 2009 by more than 4 per cent, private consumption by 1 per cent, but the recession lead to a particularly sharp contraction in corporate and residential investment, which decreased by 17 and 7 per cent respectively.

Table 3: GDP and demand growth rates in euro area 2008-10

	2008	**2009**	**2010**
GDP	0.40	-4.10	1.70
Private consumption	0.40	-1.10	0.60
Residential investment	-1.60	-6.90	-3.60
Corporate investment	1.30	-17.70	4.90
Exports	1.00	-13.20	10.70
Imports	0.80	-12.00	8.70

Source: Eurostat

A combination of demand shocks is given to generate a recession of similar size and profile for demand components in the model with automatic stabilisers operating as normal. The emphasis here on the short run and we focus on the impact in one particular year, in this case T=2009. In particular, shocks to equity risk premia related to stock and house prices cause sharp reductions in corporate and residential investment. These, combined with direct shocks to consumption and export demand, produce a decline in GDP of around 4% in the model and a distribution similar to the one in the euro area in 2009. Private consumption falls by 1%, but corporate investment falls more sharply, by 17%, while residential investment declines by 8%. An overview of the impact of the shocks is given in Table 4.

Table 4: Simulated macro-economic impact of a combination of demand shocks

	T	T+1	T+2
Percentage change compared to baseline			
Real GDP	-4.03	-3.59	-1.96
Value Added Private Sector	-4.46	-3.91	-2.07
Domestic Private Demand	-4.55	-3.51	-1.49
Government Demand	0.00	0.00	0.00
Employment	-2.43	-2.07	-0.77
Private Consumption	-1.00	-0.67	-0.28
Corporate Investment	-17.47	-13.98	-5.97
Residential Investment	-8.26	-6.24	-2.61
Government Purchases	0.00	0.00	0.00
Government Wage Bill	-0.31	-0.80	-1.01
Government Investment	0.00	0.00	0.00
Exports	-15.94	-13.96	-9.11
Imports	-9.57	-7.98	-4.56
Real Government Transfers (HH)	0.81	1.23	1.31
Price Level GDP	-0.81	-1.21	-1.29
Dollar-euro exchange rate	2.02	1.09	0.10
Percentage points compared to baseline			
Inflation GDP	-0.71	-0.26	-0.11
Unemployment Rate	1.64	1.39	0.52
Government Debt (% of GDP)	4.04	6.33	6.84
Government Balance (% of GDP)	-2.42	-2.29	-1.57
Government Primary Balance (% of GDP)	-2.36	-2.37	-1.51
Government Expenditure (% of GDP)	2.39	2.07	1.19
Government Revenue (% of GDP)	0.10	-0.20	-0.39
Trade Balance (% of GDP)	-1.54	-1.42	-1.05
Current Account (% of GDP)	-1.56	-1.50	-1.16

It should be noted that the combination of shocks that are given here to the model have a relatively high tax contents, producing a large budgetary impact, namely a deterioration in the budget balance of 2.42% of GDP. This implies a budget sensitivity of 0.60, which is larger than the average sensitivity used by the European Commission for fiscal surveillance purposes.

In the next step, the same shocks are given to the two benchmark models where automatic stabilisers are switched off. The following table gives an overview of the budgetary configurations of our simulations.

In the first benchmark budget, expenditure and taxes are kept constant at their baseline levels. Government purchases and government investment are fixed in real terms, while public sector wages are kept constant in nominal terms and public employment constant in levels. The level

of unemployment benefits paid per unemployed is kept fixed in nominal terms, as is the total amount spent on other transfers to households, mainly pensions. The cyclical components of tax revenues and the total amount spent on unemployment benefit payments are fully neutralised by offsetting changes in lump-sum tax/transfers from/to households.[3] In this case the set of shocks described above generates a decline in GDP of 4.6%, that is, about 15% larger than the decline observed in a configuration where automatic stabilisers are active.

Table 5: Overview of models

	Expenditure	**Revenues**
Benchmark budget 1	Levels fixed: $\bar{G}_i$	Levels fixed: $\bar{T}_i$
Benchmark budget 2	Ratio to GDP fixed: $\overline{\left(\frac{G_i}{Y}\right)}$	Ratio to GDP fixed: $\overline{\left(\frac{T_i}{Y}\right)}$
Automatic stabilisers on	Normal expenditure rules	Income tax progressive Other taxes proportional

In the second benchmark budget, expenditure and revenue components are kept constant as share of GDP. This is achieved by linking government purchases, government investment and transfers directly to GDP, and by indexing public sector wages to GDP, while keeping public employment constant. On the revenue side cyclical changes of tax revenues and unemployment benefit payments are neutralised by offsetting changes in lump-sum tax/transfers from/to households such that the sum of these taxes and transfers are a constant share of GDP. In this case the composite shock defined above gives rise to a drop in GDP of 5.5%, which is about 36% larger than the drop recorded with built-in stabilisers on.

The following table reports the impact of the composite shock for the three budgetary configurations considered on real GDP, the value added in the private sector and domestic private demand with its components. The associated smoothing capacity of automatic stabilisers is also reported.

[3] While this can neutralise the income effect of taxation on aggregate, it should be noted that to the extent that there are distributional effects these will not be fully neutralised (e.g corporate profit tax is borne by non-constrained households who own the firms, while neutralisation through lump-sum transfers will benefit all households equally).

Table 6: Simulated impact of a standardised composite shock for different budgetary configurations

	Percentage change			Percentage smoothing	
	Stabilisers on	**Bench-mark budget 1**	**Bench-mark budget 2**	**Compared to benchmark budget 1**	**Compared to benchmark budget 2**
Real GDP	-4.03	-4.60	-5.51	0.13	0.27
Value added private sector	-4.46	-5.24	-5.62	0.15	0.21
Domestic private demand	-4.55	-5.76	-5.42	0.21	0.16
- Private consumption	-1.00	-2.60	-2.17	0.62	0.54
- Corporate investment	-17.47	-17.15	-17.10	-0.01	-0.02
- Residential investment	-8.26	-9.25	-8.99	0.11	0.08

Note: The percentage changes show the percentage differences compared to the no-shock baseline. Smoothing capacity of GDP is calculated as $1 - \frac{\Delta GDP}{\Delta GDP_{benchmark}}$. Smoothing of individual shocks is presented in the Annex.

Table 6 shows that for a given shock the degree of smoothing varies markedly across the two alternative choices of the benchmark budget. In particular, smoothing of real GDP is much larger if the benchmark does not involve inertia of government spending over the cycle (0.27 vs 0.13). This result highlights that automatic stabilisation is not exclusively the result of the tax system.[4] In fact, the smoothing effect of keeping expenditure constant instead of adjusting it with GDP has a much bigger dampening effect on GDP than cyclical variations of tax revenues. To an extent this is just a composition effect, as becomes clear when considering the smoothing of *private sector value added*, defined as the difference between GDP and the government wage bill. The difference in smoothing between the two benchmarks for this measure is much smaller, only 0.06, suggesting a significant part of the smoothing in total GDP stems from the valuation of general government output. [5]

When looking at domestic private demand, we see that smoothing under the first benchmark is higher. Automatic stabilisers are more effective in stabilising total domestic demand in the fixed levels benchmark. Private consumption is most smoothed by the automatic stabilisers, as stabilisation mainly operates on households disposable incomes, and keeping transfers constant in levels stabilises incomes. The degree of smoothing of consumption obviously depends on the share of liquidity-constrained and credit-constrained households, which

[4] The progressivity in the income tax system adds around 3 percentage points to the output stabilisation, i.e with a linear tax system the output smoothing is 0.25 and 0.10 resp.

[5] In the absence of better productivity measures, general government output is valued at costs, and changes in government wages affect GDP and value added not only in nominal terms but also in volume terms.

amount to 40 percent in total in the model calibration. Consumption smoothing will be higher if this share is larger. Interestingly, automatic stabilisers have no impact on corporate investment. Investment decisions in the model are determined by the net present value of investment projects over their whole lifetime, and automatic stabilisers have no impact on this. In fact, there is a small increase in variability in investment, a general equilibrium effect due to higher real interest rates as consumption is smoothed by the operation of automatic stabilisers. Residential investment on the other hand is partly smoothed to the extent that credit constrained households' disposable income is affected by the automatic stabilisers.

How does the estimated output smoothing from automatic stabilisers compare to estimates of budget sensitivities and fiscal multipliers ? Fiscal multipliers for temporary shocks in the model are close to or slightly above 1 for government consumption and investment shocks, but significantly smaller for transfer shocks (around 0.4). Multipliers for tax shocks are also generally smaller, between 0.2 and 0.5 for labour and consumption taxes and close to zero for corporate taxes. [6] The average multiplier for fiscal shocks operating on household disposable income is around 0.4. With a budget sensitivity of 0.6 this would imply a GDP smoothing of around 0.24, close to the estimates reported in this section.

5. Summary and conclusions

As the euro-area member states cannot take individual monetary actions to stabilise their economies, and since the Stability and Growth Pact (and in the future the new fiscal compact) limits discretionary fiscal policy, knowing the size and effect of automatic stabilisers is particularly relevant in the EU. When determining the effect of automatic stabilisers, a benchmark budget has to be defined against which the degree of smoothing is to be measured. Earlier work on automatic stabilisation typically failed to be explicit about the type of benchmark budget used or considered only one type of benchmark.

With a view to illustrating the importance of the benchmark budget, in this paper we first clarify a number of conceptual issues and run simulations with the European Commission's QUEST model. For that purpose, two different benchmarks budgets were defined: one where the levels of both expenditure and revenues are held constant and a second that keeps the ratio

[6] Roeger and in 't Veld (2010), p. 23. See also Coenen et al (2012) for comparable multipliers in structural models of other international organisations.

of expenditure and revenues to GDP fixed. When using the fixed level benchmark the bulk of stabilisation comes from taxes and unemployment benefits, while for the fixed ratios benchmark the main sources of stabilisation is the size of government.

Our simulation of shocks that closely capture the main stylised facts of the 2008-9 recession shows that the degree of stabilisation is fairly significant, and more importantly, that it differs markedly across benchmarks. Our results indicate that automatic stabilisers could have ironed out 13 per cent of the drop of GDP in the euro area compared to a benchmark budget with fixed levels of revenues and expenditure. The degree of smoothing increases to 27 per cent when using a benchmark where revenues and expenditure follow GDP. Hence, dampening of cyclical fluctuations through the inertia of discretionary spending largely exceeds the smoothing effect of tax revenues.

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Annex

The QUEST simulation model

QUEST III is the global macroeconomic model that is used for macroeconomic policy analysis and research in DG ECFIN. It belongs to the class of New Keynesian DSGE models with microeconomic foundations derived from utility and profit optimisation and includes frictions in goods, labour and financial markets.[7] The simulations in this paper are based on a model set-up with three sectors (tradable goods, nontradable goods, construction), three types of households (liquidity-constrained, credit-constrained and unconstrained), and two regions, namely the euro area and the rest of the world.

The regions are populated by households and firms. More precisely, each region is home to three different types of households:

- Non-constrained households: These households are infinitely-lived and forward-looking. They have full access to financial markets to make optimal intertemporal choices. They consume, invest in productive capital, residential property, land and financial assets (government bonds, debt of domestic and foreign households). They own the firms in the tradable, non-tradable and construction sectors and receive income from labour, from renting capital to firms, from selling land, from financial assets and profit income from firm ownership. The share of this group of households in the total population is set to 0.6.
- Credit-constrained households: The credit-constrained households are infinitely-lived and forward-looking, but with a higher degree of impatience. They make optimal intertemporal choices, but are subject to collateral constraints on their borrowing. Credit-constrained households consume and invest in residential property. Their ability to borrow depends on the current value of their housing collateral. The collateral constraints tighten when the value of residential property falls and relax when its value increases. The share of this group is set to 0.2.
- Liquidity-constrained households: These households cannot borrow against future income, and they do not save present income via financial and real investment. In every period they consume their current disposable wage and transfer income. (share 0.2)

Tradable goods, non-tradable goods and housing services are imperfect substitutes in the consumption and investment/intermediate bundles of households and firms. In addition, tradable goods produced in one region are imperfect substitutes for tradable goods produced in other regions. The regions have monetary and fiscal authorities that are committed to rules-based stabilisation policies. Monetary authorities set interest rates to respond to output gap and inflation gap relative to their targets. Government consumption consists of purchases of goods and services, held constant in real terms in default setting, and the government's wage bill, with wages indexed to private sector wages as default. Government investment is also kept constant in real terms, while transfers to households are mainly consisting of pension payments which are fixed in nominal terms. Unemployment benefits are modelled separately and fixed in nominal terms as default and paid to all unemployed. The government pays interest on its debt, which includes a sovereign risk premium which depends on the debt-to-GDP ratio. The government collects revenue from personal income taxes, social security contributions from employers and employees, consumption taxes, and corporate profit taxes. A lump-sum tax (or transfer) acts as residual term.

The calibration of the regions' economic size, trade openness, bilateral trade linkages and sector structure (tradable, non-tradable, construction) is based on the GTAP database, while structural model parameters are based on estimates reported in Ratto et al. (2009).

[7] For detailed information, see :http://ec.europa.eu/economy_finance/research/macroeconomic_models_en.htm

Table A.1: Revenue and expenditure elasticities

	Personal tax	Corporate tax	Indirect taxes	Social contributions	Total revenues	Current expenditure
Austria	1.31	1.69	1.00	0.58	1.00	-0.08
Belgium	1.09	1.57	1.00	0.80	0.99	-0.16
Cyprus	2.10	1.50	1.00	0.70	1.14	-0.02
Estonia	0.80	1.40	1.00	0.70	0.90	-0.05
Finland	0.91	1.64	1.00	0.62	0.92	-0.21
France	1.18	1.59	1.00	0.79	0.98	-0.12
Germany	1.61	1.53	1.00	0.57	0.97	-0.27
Greece	1.80	1.08	1.00	0.85	1.07	-0.04
Ireland	1.44	1.30	1.00	0.88	1.14	-0.16
Italy	1.75	1.12	1.00	0.86	1.17	-0.04
Luxemburg	1.50	1.75	1.00	0.76	1.14	-0.04
Malta	2.20	1.40	1.00	0.40	1.04	-0.02
The Netherlands	1.69	1.52	1.00	0.56	1.01	-0.42
Portugal	1.53	1.17	1.00	0.92	1.08	-0.09
Slovakia	0.70	1.32	1.00	0.70	0.88	-0.04
Slovenia	1.40	1.50	1.00	0.70	0.96	-0.13
Spain	1.92	1.15	1.00	0.68	1.09	-0.16
Euro area average	1.48	1.43	1.00	0.74	1.04	-0.15

Source: Girouard and Andre (2005) and European Commission (2006)

Table A.2: GDP Smoothing capacity for individual shocks

	Consumption shock	Housing shock	Export demand shock
Smoothing compared to benchmark budget 1	0.17	0.13	0.12
Smoothing compared to benchmark budget 2	0.32	0.28	0.27